THE JOURNAL FOR LIGHTWAVE 3D® ANIMATORS

LIGHTWAVE™ PRO

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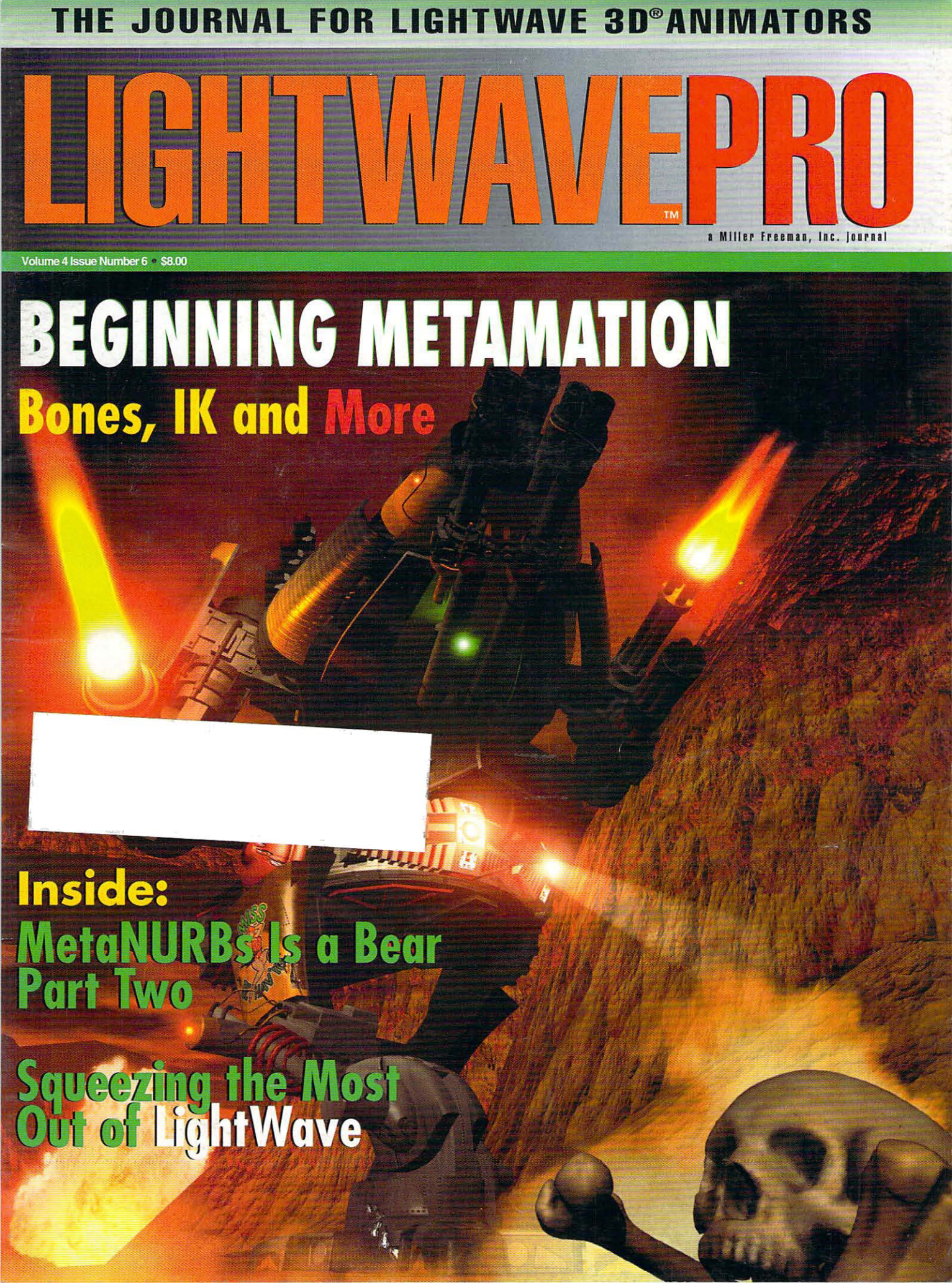
BEGINNING METAMATION

Bones, IK and More



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MetaNURBs Is a Bear Part Two

Squeezing the Most Out of LightWave

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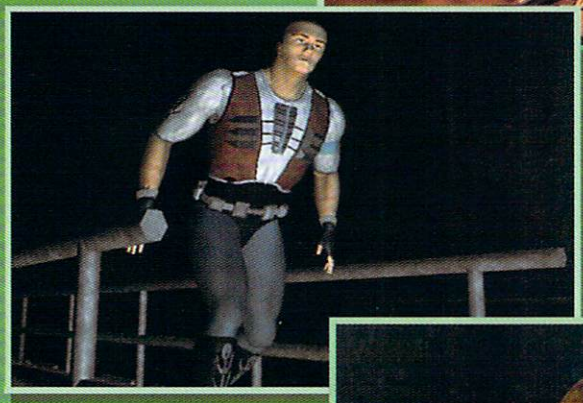

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EDITOR'S MESSAGE

by John Gross

I'd like to start off by letting people know what's going on with *LIGHTWAVEPRO*. As all of our readers are (painfully) aware, *LIGHTWAVEPRO* has had delivery problems since just about the beginning. Lately, it has become much worse. I'll step up to the plate and take total responsibility for the delays. No need to get into lengthy explanations as to why, but I'd like you to know that everyone on the *LIGHTWAVEPRO* staff is diligently working on trying to get *LIGHTWAVEPRO* caught up and shipping on time.

You should expect better delivery as time goes on and soon you'll be getting *LIGHTWAVEPRO* in the actual month for which it's intended (or before)!

New Stuff

There are a few new things available from NewTek on-line:

• Arnie Cachelin's new VRML plug-in is available which covers the new VRML format. (Look for a LightWave VRML article soon in *LIGHTWAVEPRO*).

•There is a new Surface Blur plug-in that fixes the 0%-1000% countdown problem and, as mentioned last month, there is the patch available to upgrade LightWave and Modeler to Rev C. By the way, one of the bugs fixed in this patch is the Lens Flare Ring Size Envelope bug reported in a former Dear John column in *Video Toaster User*.

Look for these and potential new patches and plug-ins on-line at Compuserve, America Online and various Internet locations, as well as NewTek's BBS and ftp.newtek.com.

Dan Ablan, a regular *Video Toaster User* and *LIGHTWAVEPRO* author has been hard at work on *The LightWave Power Guide*. It will soon be released from New Riders publishing. This book is the first commercially available book on LightWave, and can be found at your local bookstore. Covering through version 5.0 of LightWave, *The LightWave Power Guide* is 500 pages of information with color inserts and a CD-ROM. Close to half of the book is dedicated to tutorials alone, from introductory modeling, to tracing images

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Here's the first part in a two-part tutorial on fire and ice. Hot stuff!

LIGHTWAVEPRO
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"We provide the most valuable information to people who use technology to create messages with impact."

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About this month's cover: This month's cover, by Dinko Cepak, is part of a 4-minute music videoclip. The project ws created with LightWave 4.0b. This scene consists of 80526 polygons and 145 surfaces with 28 images. dinko Cepak is a freelance 3D animator and can be found on IRC channels #ICE and #Lightwave. He wishes to thank Allen J. Dybas and all other members of ICE for their support.

From the Net

Put MetaMation to Work for You

by Dan Ablan

Welcome back to *LIGHTWAVEPRO's* Internet column. You may remember this as "Internet@LWPro.Online," but have not seen it in the past couple of issues. There are two reasons for this. First, I was hidden away day and night writing *The LightWave Power Guide* for New Riders Publishing. Now that it's complete, I can get back onto a normal schedule which means devoting more time to *LIGHTWAVEPRO*. The other reason you haven't seen the Internet column is because of its slight reconstruction. We are refocusing this column to keep pace with advancements in LightWave 3D software, the growing user base, and comments from our readers. Often, solutions to LightWave-related problems are solved within hours from fellow LightWavers across the world on the Internet. Different LightWave users in different locations, all with different clients constantly post very good "how-to" questions. These questions open doors of creativity to some while bringing more confusion to others.

"From The Net" will have a specific tutorial each month from Internet discussions. This will benefit all LightWave users regardless of Internet access. For those "techie" people who do like to visit the World Wide Web, the column often will include a list of cool LightWave-related sites.

The explosion of LightWaver's using 5.0 is phenomenal. Many 4.0 users aren't quite sure of everything 5.0 can do, especially since some just upgraded to 4.0 a few months ago. At times, this column will address 5.0 LightWave topics, but many general LightWave techniques will often be covered as well. Use this column to learn about your new upgrade to 5.0, or why you should upgrade.

Since LightWave 5.0's release at this year's NAB in Las Vegas, there have been too many posts on the Internet about the new MetaMation plug-in to ignore. It seems there is a big misunderstanding of what MetaMation really does and how to use it. In this tutorial, you'll create simple objects in Modeler, then animate them in Layout using the MetaMation plug-in. To begin, understanding what the plug-in does helps to understand how to use it. MetaMation makes character animation simpler than previous versions of LightWave. This plug-in actually Metaforms the object on every frame prior to rendering. What this means is, you can animate with simple boxes or primitive shapes but your renders will use the smoother, higher polygon count objects.

Adding the Metamate.p plug-in will really add two plug-ins, Metaform_Shaper and Metaform_Target. Both plug-ins will be loaded from the Objects Panel, under the Disp Map Plug-Ins button. The primitive shape (pre-metaform object) uses the Metaform_Shaper plug-in. The actual Metaformed object uses the Metaform_Target plug-in. Also important to know is that the primitive objects must be Metaformed using the new MetaformPlus plug-in in Modeler. Set up is crucial to a working Metamation scene, so follow along closely as you create a simple character using MetaformPlus and Metamation.

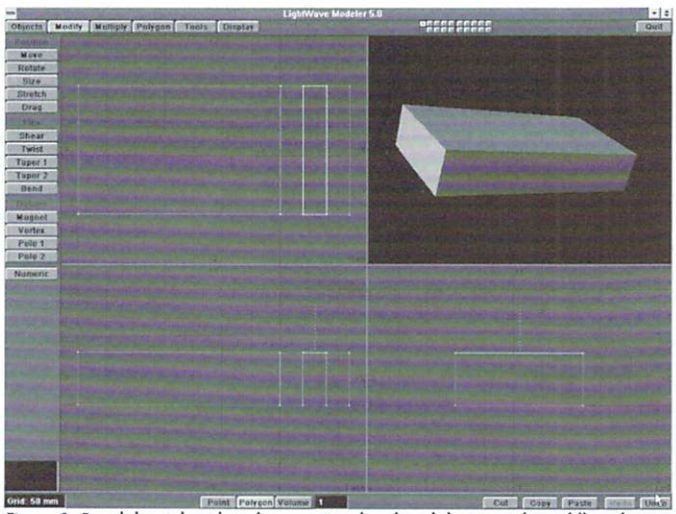

Figure 1: Bevel the right side polygon twice, then bevel the top right middle polygon.

Figure 2: The leg and foot shapes are built from a single box and several bevels.

Creating The Shapes

To begin, load Modeler and select the Box tool from the Objects menu. Create a box with these settings (select Box and press (n) for numeric).

	Low	High	Segments
	-350mm	0m	1
	-0m	90mm	1
	-100mm	120mm	1

This will become the foot object for the leg you're going to make. Select the right most polygon from the face view. Press the (b) key to call up the Bevel requester. Bevel the single polygon with a 40 mm value for Shift. All other values should be 0 m. Bevel twice more with the same value. Deselect the polygon using the (/?) key. Now select the top right middle polygon as in figure 1.

Bevel this polygon twice with the same setting of 40 mm for the Shift value. What you're building here is the farthest from complex. It is a very simple box object to demonstrate the use of MetaMation. However, the techniques to make this foot and leg object can be used to create very smooth detailed objects. From this point, it's a matter of beveling single polygons to create extensions on the leg, and sizing each accordingly. Figure 2 shows the final simple box object ready to be Metaformed.

Move points in from the side view to angle the shape of the foot, and perhaps bevel the toe polygon to add a little more shape. You're simply beveling single polygons, sizing and moving each to make a leg. Once this object is to your liking, save it as BoxFoot.lwo. This will become the Metaform_Shaper object. With the same object loaded in Modeler, run the MetaformPlus plug-in (Choose the Custom command in the Tools panel). Select a Subdivision Level of 3. Save this object as MetaFoot.lwo (you can Export both of these as well). Figure 3 is the final Metaformed object.

(Note: Remember, you must use the MetaformPlus plug-in to Metaform the object. Normal Metaform won't work properly for use with MetaMation.)

Now in Layout, load both the BoxFoot.lwo and the MetaFoot.lwo if you didn't Export them. You can set up the scene with either the bones first, or with MetaMation first. For this example, let's set the MetaMation first. Go to the Objects Panel and select BoxFoot.lwo as the Current Object. Click the Displacement Map Plug-In button, and select Metaform_Shaper. Click the Options button to call up the Meta Shaper Interface and select the object to be Metaformed from the pull down selector. In this case, BoxFoot.lwo is chosen. Enter the Subdivide level that you used in Modeler to Metaform the object. The subdivision level was 3, so enter 3 in the value field as in Figure 4.

Click OK. Click Continue from the Displacement Map Plug-In requester, and now select MetaFoot.lwo as the Current Object. Enter the Displacement Map Plug In requester again, and select Metaform_Target from the plug in list. Click the Options button and from there, again choose the BoxFoot.lwo in the Meta Target Interface, as in Figure 5.

Lastly, select BoxFoot.lwo as the Current Object again and set its Object Dissolve to 100%. This isn't really necessary, but helps clean up the Layout. And, the BoxFoot.lwo object won't actually render.

That's it to set up a MetaMation scene. Easier than you thought? Well, to take a look at how it works in Layout, let's set up some bones.

Select the BoxFoot.lwo object and then select Bones as your Edit item. Press the plus (+) key on the numeric keypad to add a bone. Position the bone and set it's Rest Length to match the top half of the leg object. You'll need to Rotate the bone 90 degrees in Pitch to match your model. Once in place, create a key for it at frame 0 and then press the equal (=) key for Add Child Bone. Set the Rest Length on this bone slightly smaller than the first and create a key at frame 0. Add another child bone and rotate it to -90 degrees on it's heading, and zero for both the pitch and bank. This places the bone in position with the foot. Also, adjust the Rest Length to fit the foot area of the object. When finished, create a key for it, also at frame 0. Finally, add another child bone and set the Rest Length very small as this will become the Toe Bone. The real reason to set this bone's Rest Length so small is because when you place a null object as a Goal for Inverse Kinematics, it's affecting position is automatically placed at the bone rotation, which would be towards the heal. Adding a small "tip" bone allows a Goal to be placed at the tip of the foot for control. Figure 6 shows the final simple bone structure. It also may be a good idea to name each of the bones from the Object Skeleton panel for easy identification. Make sure that you create a key for

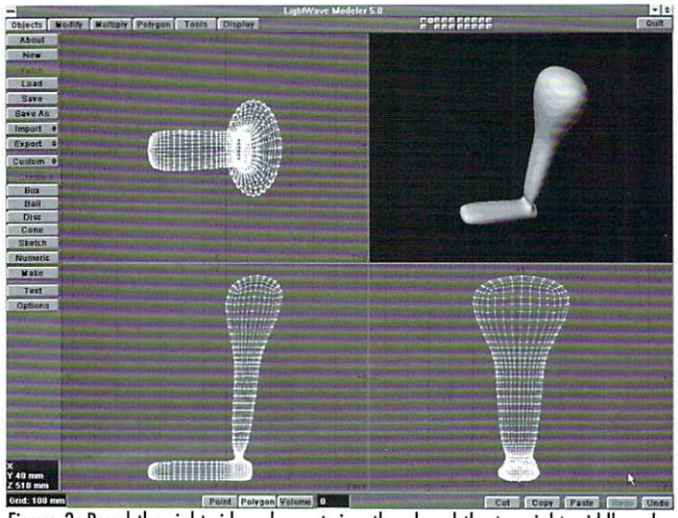

Figure 3: Bevel the right side polygon twice, then bevel the top right middle polygon.

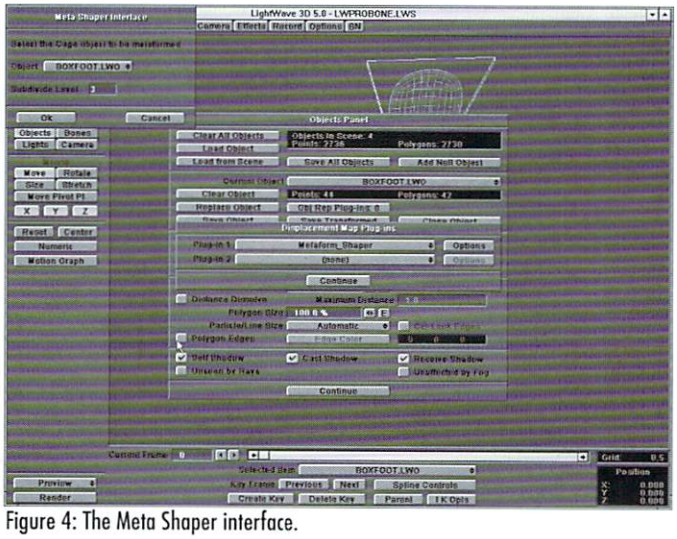

Figure 4: The Meta Shaper interface.

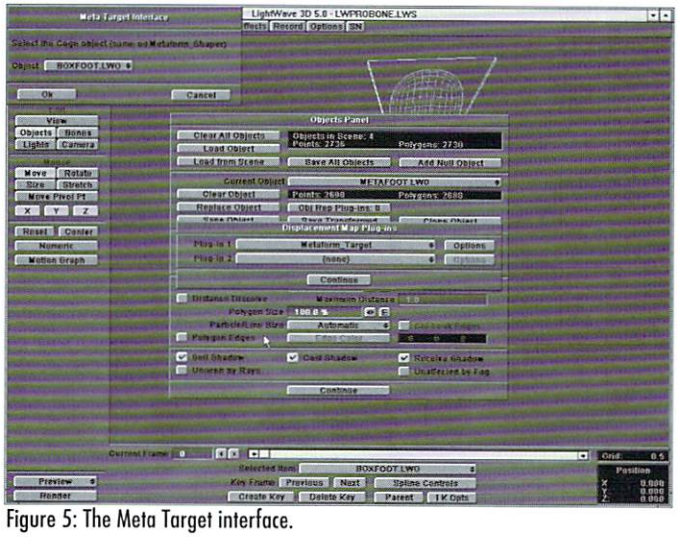

Figure 5: The Meta Target interface.

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Squeeze Play

The Old Car Through the Keyhole Trick

by Patrik Beck

Believe it or not, it is sometimes worth while to take a peek at what is happening with 3D software other then our favorite NewTek product. If we see a cool function that LightWave 3D currently lacks, it gives us something to complain about. Chances are the next upgrade will address that lack. Glow, inverse kinematics and NURB modeling are all examples of this kind of feedback. In writing it's called plagiarism—in software development it's market research.

Another reason for checking out the other guys is to inspire new ideas that would not normally occur to you in a LightWave-only environment. I don't know about you, but I get a kick out of reproducing a "high-end" effect created with very expensive software (that costs more than my house), even if it does mean jumping through a few hoops to get there.

> Ask yourself, what happens to a bone during an object morph? The answer is nothing.

One interesting effect I saw demonstrated at the 1995 NAB convention involved moving a 3D object through a constriction. The example was pushing a '57 Chevy through a keyhole. While I don't know if anyone would ever actually need to push a '57 Chevy through a keyhole, I do know that it looked really cool and that there had to be a way of doing it with LightWave.

Before you start thinking dozens of morph targets or hundreds of painstaking bone keyframes (both of which I have tried, by the way) I'll skip to the punch line and tell you that it can be done very simply using only one bone!

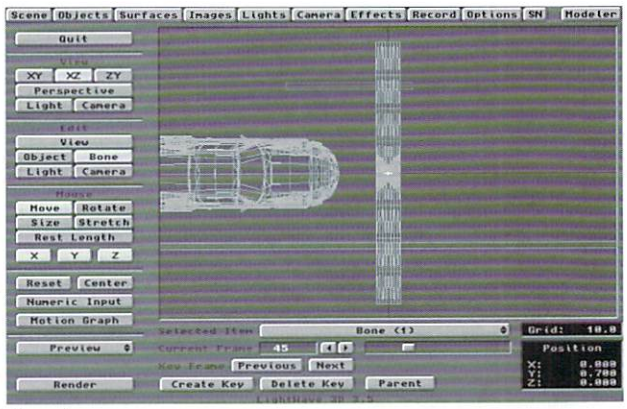

Figure 1

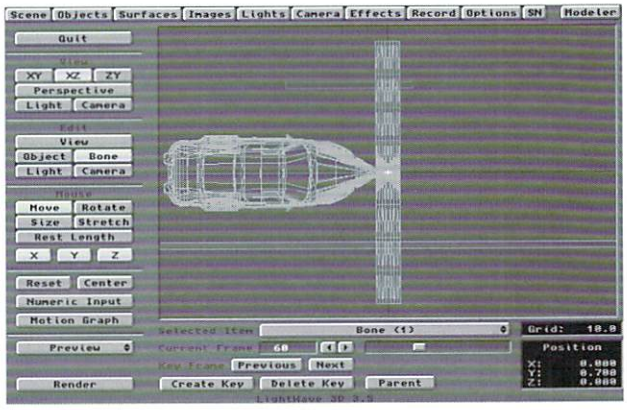

Figure 2

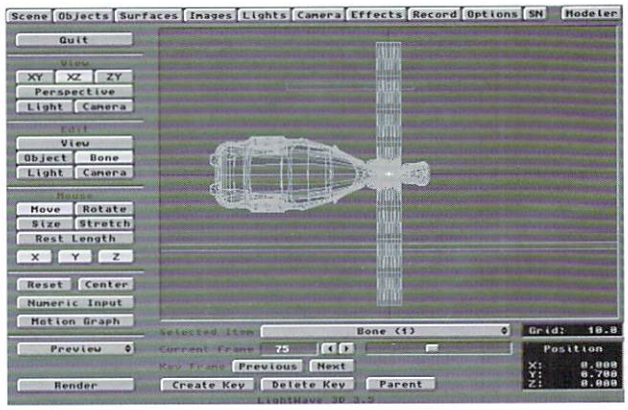

Figure 3

The Bone Is the Key

The effect I saw would be similar to the effect of a free-floating, scaled-down bone not associated with an object that affected any points that moved into the field of its limited range. This type of bone is not yet possible in LightWave, but smells like a plug-in to me. I racked my brains and the brains of a few others to get around this limitation, then it finally came to me while sitting in one of the classes at the Video Toaster User Expo listening to a completely different topic.

Ask yourself, what happens to a bone during an object morph? The answer is nothing. The bone is referenced to the object axis as if it was a parent, not to the changing geometry of the object. By turning on limited range for the bone, points of the object can move in, out and through its

influence range by the process of an object morph.

Just Do It

As is often the case, describing the technique is a lot more complicated then just doing it, so here is a step-by-step example:

- In Modeler, load one of the cars from the Objects/vehicles directory.
- Move the car backwards ten meters (move Z -10m) and save it as CarFrom.lwo.
- Move the same car object forward twenty meters (move Z 20m) so that it is now 10 meters forward of the point it was when it was originally loaded. Save this as CarTo.lwo.
- Go to layout and load both objects.
- Setup a morph. CarFrom.lwo object is the source and CarTo.lwo is the target, Create a Metamorph Amount envelope that goes from 0% to 100% morph in 30 frames.
- Set dissolve amount for CarTo.lwo at 100% to get it out of the way, or simply move it off the screen.
- Select the overhead view on the Layout screen, move the scrub bar back and forth and you should see the car object moving forward and back in a straight line as it does an object morph from one position to the other. Move the camera to an appropriate position, using the midpoint, frame 15, as a reference.
- Add a bone to the CarTo.lwo object with limited region of 1.5 minimum and maximum range. Keep centered on the X and Z axes but move it up about 1 meter so it is as high as the middle of the car object. Key frame the bone in that position at frame 0 and activate it.
- Once the bone is activated, select stretch and reduce the X and Y scale by half, leaving Z at full size. X=.5, Y=.5, Z=1. Key frame those values also at frame 0.
- Render a wireframe preview.

Tweaking

You should now see the car object moving forward and appearing as if it is being squeezed through a constriction as it enters and leaves the region of bone influence. This is the basic setup. Any object you use will need a large number of small polygons to avoid rendering errors. You can also adjust the rest length and minimum affected area for the best results, as these settings will change depending upon the size of the object and the amount it is being constricted.

You do not have to stick with constrictions. You can have the object increase in size as if it is being seen through a magnifying glass. If you add several bones and move and rotate them you can get a very nice snaking liquid effect, especially if you mix in some displacement mapping. This brings us to the next topic.

Bubbles

One of the things I tried to create a constriction for was displacement mapping. It didn't work for that but it did lead to creating what I feel are the most realistic bubbles ever rendered. The trick is to use the right amount of displacement mapping and achieving the proper surface.

In a nutshell, create a sphere with lots of polygons, apply a Fractal Noise displacement map set to world coordinates, and give the bubble object a floating type motion path.

Here are the specifics on my bubble and surface values:

Bubble size: 1 meter sphere (500mm diameter)

Displacement map values:

Fractal bumps	
size	1,1,1
amplitude	0.1
freq	3
use world coordinates	

Bubble surface:

color	Front projection map of background image
diffuse	13%
specular	200%
medium	
reflect	75%
trans	75%
smoothing	179.5
double-sided	

Key frame the bubble object so that it moves past the camera and generate a wireframe preview to get a general idea of the amount of displacement that's happening. Do a test render with the given values. The wireframe can mislead you to what the finial animation will look like. Once you have a bubble you like, clone it a few times and scatter them around. You may want to give the bubble's displacement maps slightly different values so they don't look the same. At least give them different texture centers.

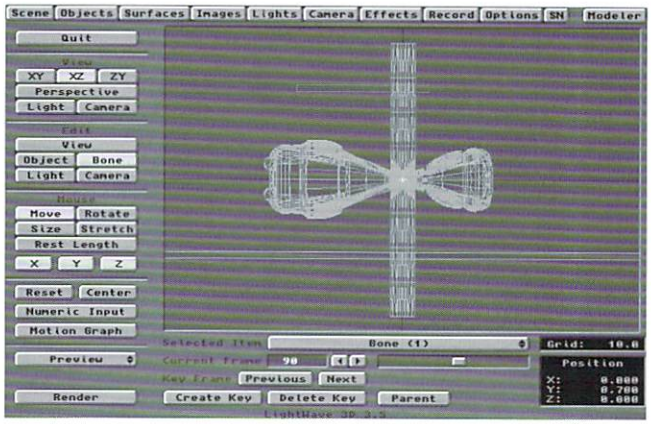

Figure 4

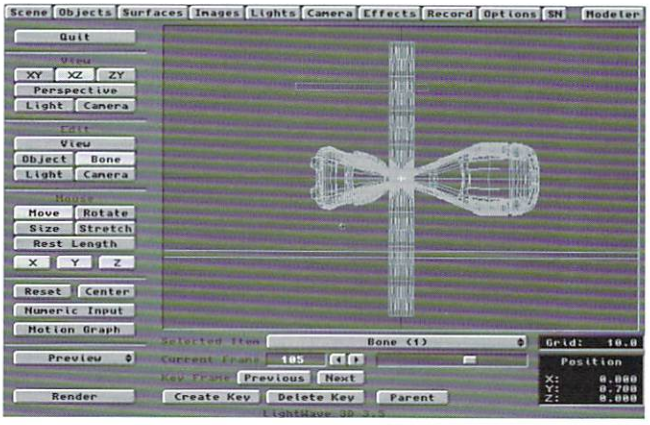

Figure 5

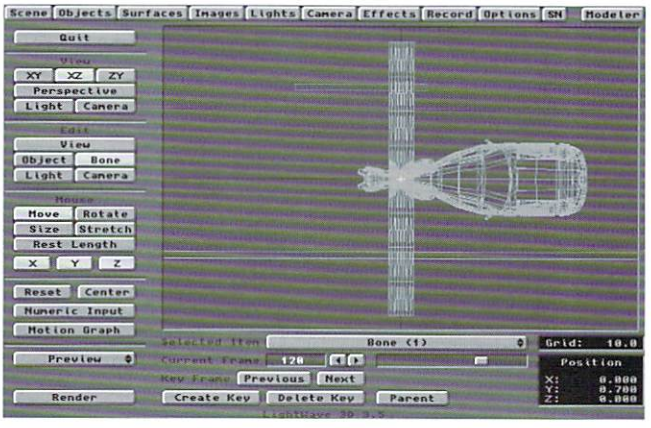

Figure 6

Getting Back to Work

Sure, its fun to goof around in LightWave like this, but will it pay any bills? Up to you, but having a few more magic tricks in the toolbox might be just the thing to zip up that next flying logo.

LWP

Patrik Beck is an animator and president of Electric Crayon Studio in Milwaukee, Wis. He has a wife and two children, none of whom he's seen since the release of LightWave 5.0. His dream is to one day earn a cool nickname like Mojo. Reach him at Zippe@execpc.com.

MetaNURBS Is A Bear

The Tale of the Teddy Bear: Part Two

by Arnie Boedecker

In last month's article, I went through the procedure of modeling a basic Teddy Bear head, using one of LightWave 5.0's new Tools, MetaNURBS. In this second installment, we'll complete modeling the Teddy Bear's body, and lay out a few guidelines to animate our new character. We'll be using MetaNURBS to form the basic shapes of the body, arms and legs. Similar objects could be modeled using tools other than MetaNURBS, but the intent of this tutorial is to utilize MetaNURBS as much as possible in an effort to show its benefits and possibilities.

Nice Bod!

MetaNURBS works exclusively with four-point polygons. This being the case, it quickly becomes a habit to start out with a box, when intending to model with MetaNURBS. The situation is no different here, so start out building a box (everyone know where the Box Tool is?) with the following dimensions:

	Low	High	Segments
X	-100 mm	100 mm	1
Y	-240 mm	-15 mm	1
Z	-100 mm	100 mm	1

Use the Metaform Tool (Polygon/Subdivide Menu) to give us a few points to work with. Metaform the box twice to form a basic sphere shape that will become our bear's body.

OK, go ahead and press that TAB key to activate MetaNURBS. If your system allows, turn on Smooth Shaded Preview (Display/Options Menu) so you can better see the interactive effect of MetaNURBS.

First, let's taper in the top of the Bear's Body, to slim it's shoulders, and widen it's belly. Using the Taper 1 Tool (Modify Menu), use a positive sense taper on the Y-axis with a factor of 0.8 and its center at the origin. Next, use the Stretch Tool (Modify Menu) to size down the body slightly using stretch factors of (0.96, 0.88, 0.85) and a center of (0 mm, -130 mm, 0 mm).

As with the Bear's head, the body will be symmetrical, so to make things easier, we'll delete one half of the bear's body, then mirror it back later. Using Polygon as your selection type, drag a lasso around either half of the body. Once you have exactly half of the body selected, hit the Z key to delete that half.

One nice feature of MetaNURBS, is its use of four-point polygons. If you need your model to have a higher density of polygons, it's just a Metaform away. Say you just wanted an extra row of points or polygons. That's easy, too. You just have to make sure you keep the four-point polygon structure consistent.

With our Bear Body half, let's add a row of points, just inside from the Y-axis, for greater detail. To do this, go to a new layer and put the Bear Body half in the background layer. Now, use the Box Tool to draw a box in the Face View which just overlaps into the Bear Body along the Y-axis, where you'd like the new points to slice in. Then switch layers using the (') key to put the Bear Body in the foreground and the new box in the background. Now use the Slice Tool (Tools/Drill Menu) to slice the box through the Bear Body on the Z-axis (Figure 1). By slicing the four-point polygons straight through we are able to add a row of polygons, while keeping the four-point polygon construction.

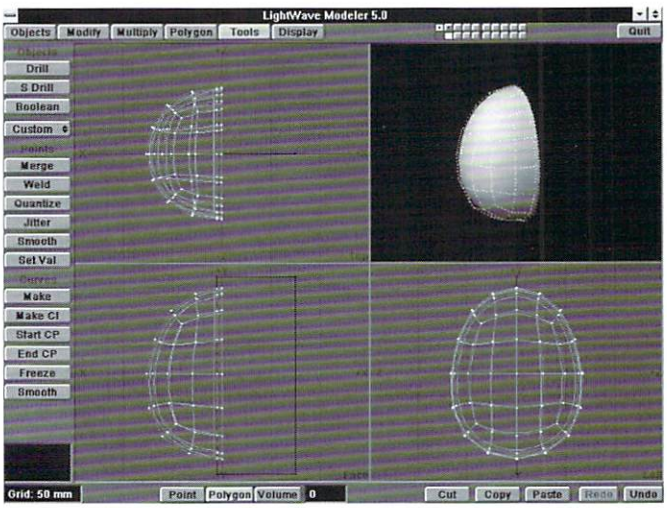

Figure 1

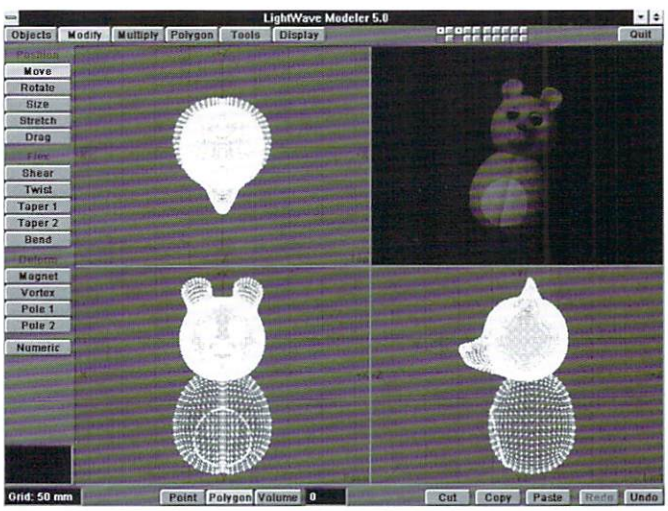

Figure 2

A Matter of Seams

By now your probably asking yourself, why in the world did we do all that? Well, what would a Teddy Bear be without all of those obvious seams that stitch the whole cuddly creature together? So, this extra row of points, when the center points are sized down slightly, will help create a seam down

the center of the body.

Go ahead and lasso the points on the Y-axis (there should be 16 points) and use the Size Tool (Modify Menu) to size them down by a factor of 0.9, with the center (0 mm, -130 mm, 0 mm). Deselect the points, then use the Mirror Tool (Multiply Menu) on the X-axis to create the body's other half. Finally, be sure to Merge Points (Tools Menu) to get rid of any duplicate points.

See the seam? By selecting all of the points along the Y-axis, you can size these points to make the seam as deep or as shallow as you prefer.

Once you are satisfied with the seam, and the overall shape of the body, it's time to Freeze the MetaNURB patches into polygons. If you remember, when we froze the Bear's Head in the first article, I suggested a Patch Division of 4 or 5 to retain a great amount of detail. In this case, our body shape is pretty simple, so a Patch Division of 3 is more than sufficient. You can change your Patch Division value in the Objects/Options Menu. Then use the Freeze Tool (Tools Menu) to convert the MetaNURB patches into polygons. You may want to triple the polygons to avoid non-planars, as well.

Now hit the Q-key to give our Bear's Body a basic surface. We'll use the same BearSkin surface on the Bear's Head, on the Bear's Body as well. Give it a color of (100, 60, 10) and turn on smoothing.

Adding Detail

Okay, what else can we do to detail this animal's torso? How about adding a patch of lighter fur on the bear's belly? That's easy enough. In a new layer, draw out and create a circle using the Ball Numeric Tool with 32 sides, a center of (0 mm, -154 mm, 0 mm), and dimensions of (46 mm, 44.5 mm, 0 mm).

Let's taper this circle to better match the shape of the body. Use the Taper 1 Tool again, with a positive sense and a factor of 0.82 on the Y-axis, with a center at the origin (0,0,0). This circle is our template for the "light belly fur". With the body in the foreground, and the new belly template in the background, select only the polygons on the front of the body by drawing a lasso around the front of the body in the Left View.

Once the front polygons are selected, use the Stencil Tool (Tools/Drill Menu) on the Z-axis, creating a new surface, BearSkin-Lt. The belly-fur patch should now be sliced into the Bear's Body with it's own surface. Deselect all polygons, and then select only the belly-fur polygons using Polygon Statistics (W-key). Surface the belly-fur by pressing the Q key, and giving it a lighter color of (135, 100, 35), and turn on smoothing.

I decided to have the belly fur stick out a bit from the rest of the body, so with the BearSkin-Lt polygons still selected, use the Smooth Shift Tool (Multiply Menu) with a value of 1mm. To avoid smoothing errors, bring down the smoothing angle to about 30 degrees.

To get a better idea of how we're doing, let's load the Bear's Head into Modeler to view the head and body together. In a new layer, load in your previously modeled head, BearHead.lwo, and then put both the head and the body in the foreground layer by using the Shift key when selecting layers. By looking at our objects in the smooth shaded preview, you can see that we're doing okay, but the body needs a bit of final tweaking.

Make sure that only the body is in the foreground, and using the Stretch Tool, lets make the body a bit more squat with factors of (1.0, 0.96, 1.0), and a center at the origin. Put the Head in the background for reference, and move the body into place in relation to the head to your tastes. I simply moved the body back slightly (10 mm on Z). When you are happy with the body's position, the final step is to save the object as BearBody.lwo (Figure 2).

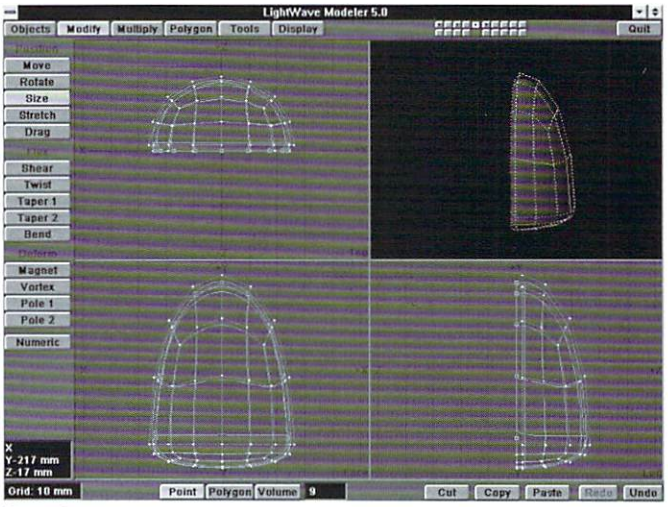

Figure 3

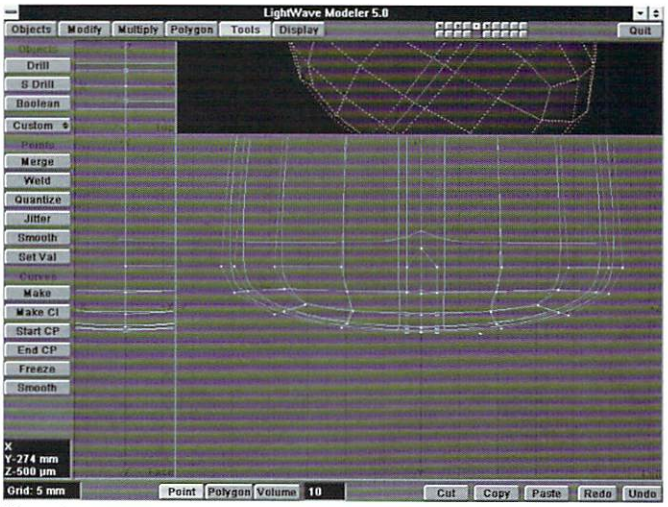

Figure 4

Adding Appendages

All right, it's time to make the Bear's arms and legs. To keep things simple, we'll create a leg, complete with seam and footpad, and use a smaller version of the completed leg for the arms. We will once again use the MetaNURBS Tool to create the Bear's limbs, with one new trick: We only want our seam to appear along the length of the limbs, and not across the pad at the end. You'll understand this better as we begin to model the object.

To start out we need to make (what else?) a box:

	Low	High	Segments
X	-30 mm	30 mm	1
Y	-320 mm	-180 mm	1
Z	-30 mm	30 mm	1

You'll instantly see that our box is well below the origin. This is because we will be building a leg first, and to better judge the size of the leg, I began to construct it beneath the Bear's Body. Once the leg is modeled, we'll move it into place, to create each leg as well as each arm.

To form the leg, let's first Metaform the box twice. Then activate MetaNURBS by hitting the Tab key. With Points as your selection type, lasso the bottom half of our new MetaNURBS patch object grabbing a total of 41 points. Then use the Stretch Tool to shrink down the bottom half into a basic footpad. Use a Stretch Factor of 0.14 on the Y-axis and a center of (0 mm, -250 mm, 0 mm).

Rather than having the seam running down the front, this time we'll want seams running down the sides of the arms and legs. So we will still delete half of our object, as we did with the Body, but we'll do it in the Left View.

With Polygon as your selection type, draw a lasso around either half of the leg, and then hit the Z key to delete those polygons. As with the body, we will want an extra row of points sliced in, to help create our seam. In a new layer, put the new leg in the background, and draw out a box in the Left View which just overlaps into the leg along the Y-axis. Then, with the leg in the foreground and the new box in the background, use the Slice Tool to slice in the new row of points just as we did for the Body,

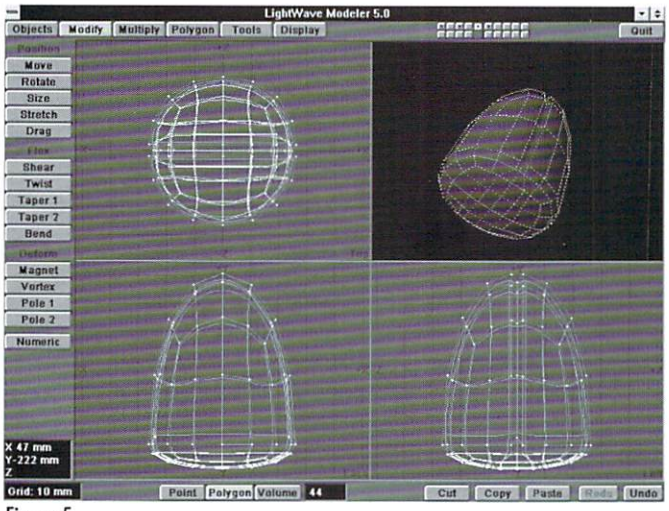

Figure 5

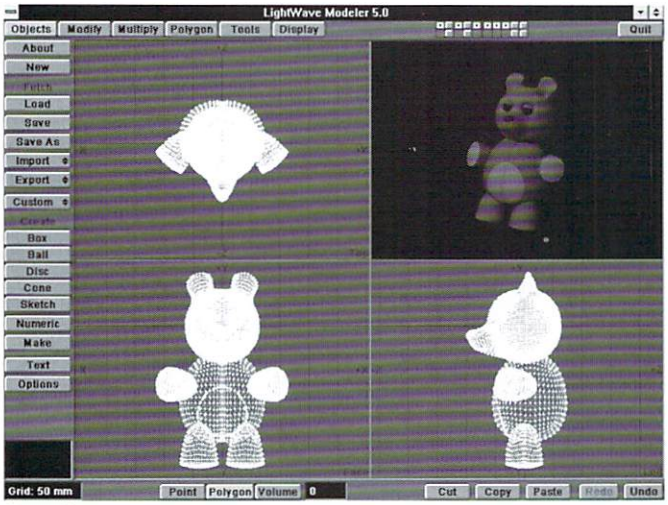

Figure 6

Figure 7

only this time Slice on the X-axis.

Next we'll want to grab the points on the Y-axis to size them down to create the seam, but this time we only want to grab the points on the side of the leg, not those on the footpad. So deselect the points on the bottom which belong to the footpad, and you should end up with 9 points selected. Then, using the Size Tool, size those 9 points down by a factor of 0.9 and a center of (0mm, -225mm, 0mm) to create the seam (Figure 3). At this point, you can deselect all the points and use the Mirror Tool on the Z-axis to complete the leg shape. As always, be sure to Merge Points to get rid of duplicate points.

If you have your smooth shaded preview on, you'll notice that our leg seam still shows up a bit across the footpad. To get rid of this unwanted seam, go to the Left View and grab the 5 points to either side of the Y-axis on the footpad, for a total of 10 points (Figure 4). Then use the Stretch Tool with factors of (1, 1, 3) and a center at the origin, which will move the 2 rows of points away from the center seam, and the whole footpad smoothes over nicely.

The footpad still needs to be a bit more distinct, however. To do this, let's select the polygons that will make up the footpad (Figure 5), for a total of 44 polygons. Once you have the footpad polygons selected, use the Move Tool (Modify Menu) to move them up 6mm on the Y-axis. This creates a nice subtle edge between the leg and the footpad. Before deselecting the footpad polygons, press the Q key to assign the BearSkin-Lt surface. Then invert your selection (Display Menu) and assign the BearSkin surface to the leg polygons.

Finally, complete the leg by Freezing the MetaNURBS into polygons. After Freezing, I decided the leg could be a tad bigger, so using the Size Tool, I sized it by a factor of 1.25. Before saving, triple the polygons to avoid non-planars.

To create the final Leg and Arm objects, move this object to a desired leg position. I moved it approximately (-40mm, 70mm, 0mm) from where it was modeled. Once you have it in place, use the Mirror Tool over the Y-axis to duplicate the other Leg. Save these as separate objects, Leg-L.lwo and Leg-R.lwo, by cutting one leg and pasting it into a new layer.

Size one of the legs by a factor of 0.9 to create an arm. Then, with the Body in the background for reference, use the Move and Rotate Tools (Modify Menu) to get the arm up to the shoulder position. Be sure to Mirror the arm to create the second, and save them as two separate objects, Arm-L.lwo and Arm-R.lwo, as we did with the legs. Figure 6 shows the Bear's Head, Body, and Limbs as located in Modeler.

Final Modeling Ideas

Depending on how ambitious you are and how much detail you want your Teddy Bear to have, there are still many modeling options available. You may want your Bear to have whiskers or eyebrows. There is also the Great Teddy Bear Tail Debate (some Teddy Bears have tails, some don't. How about yours?). Also, if you plan on having your Bear "come to life," you may want to construct more detailed eyes, including pupils. Jeff Scheetz' article, "Windows to the Soul" (February 1996 *LIGHTWAVEPRO*) is an outstanding article on creating eyes for characters. Anyway, when all of your modeling is finished, we're ready to animate, so let's move on to Layout.

Making the Teddy Bear Move

You'll need to load all of the objects we have been modeling into Layout. These should include the Teddy Bear's Head, Body, Legs, Arms, the Eyes and Eyelids, if you saved them as separate objects, as well as anything else you've modeled or saved separately. The procedure I used to model all of the objects allows them to load into place in Layout. The benefit of this, is that the body parts are right where they are supposed to be when loaded. The downside is that all of the objects still have the origin as their pivot point. What we will need to do, is go through each object, and set a new pivot point. But before we do that, let's set up the correct hierarchy. This is pretty easy with our simple Bear.

Parent both Legs and both Arms, as well as the Head to the Body, and parent the Eyes and Eyelids

see MetaNURBs, page 15

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Bird In Flight

This is a rendered composite image showing one complete flight cycle of the bird character. The wing motion is created from a series of Metamorph Targets.

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SqueezeCar

This image shows the effects of "squeezing" an object through a scaled-down bone while utilizing a morph to move the object from point A to point B.

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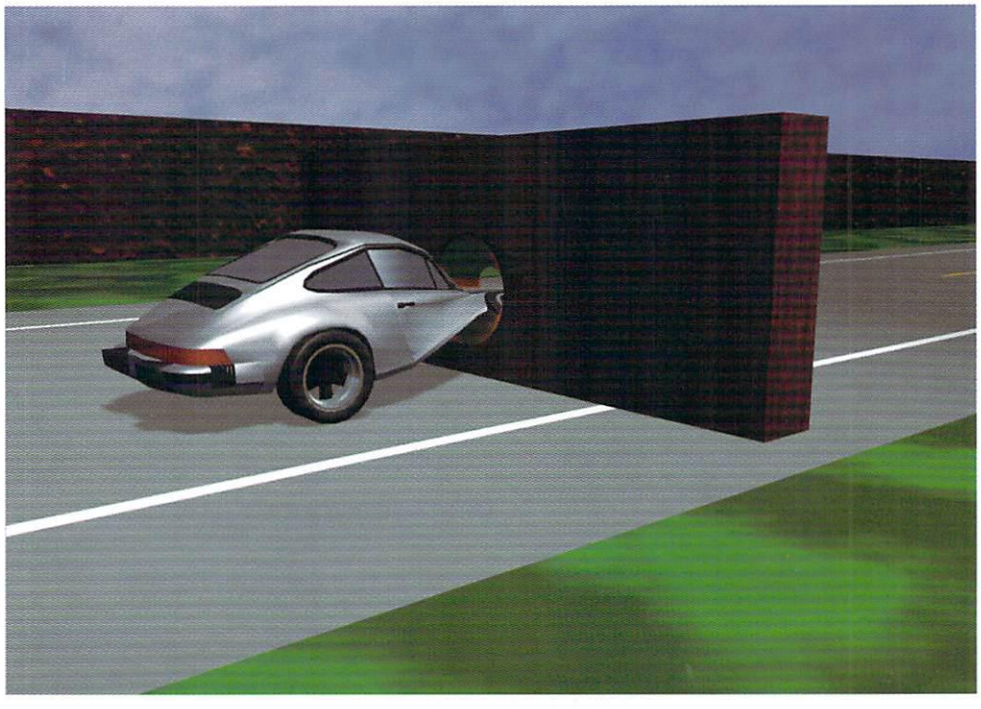

FireTube
The effects of a realistic fire texture on a modeled tube.
Copyright©1996 Jean-Babtiste Laugere

Pair O'Bears
These Bears can be made quickly using MetaNurbs. Bring them to life and add Character Animation to your demo reel. Just don't eat their porridge!
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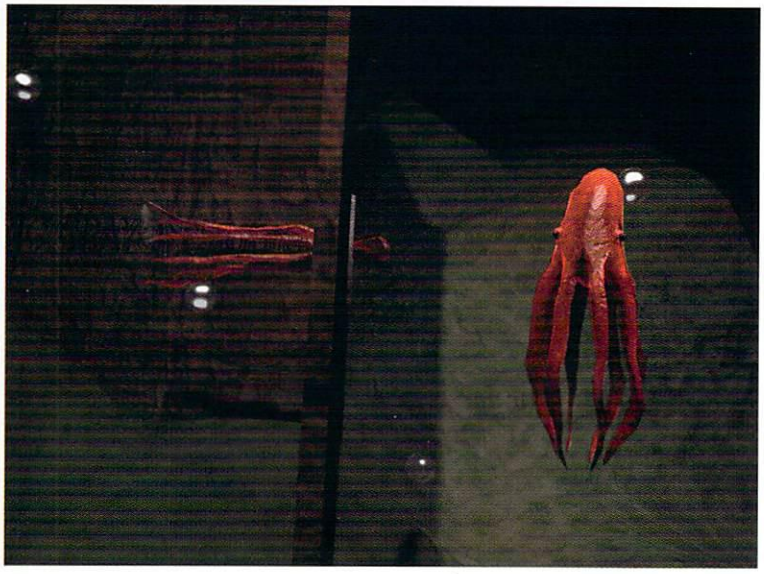

Squid Images
This image show the results of using bones and a morph target to "squeeze" an object through a constriction.
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Editor's Message

continued from page 3

with 3D splines, to frying bacon animating a skyscraper, and more. You can find *The LightWave Power Guide* in bookstores toward the end of September.

Congratulations to Dan for completing this book. I'm sure, it will be a big winner.

That's it for this month. Hopefully, it won't be so long until you have the next issue of *LIGHTWAVEPRO* in your hands!

John Gross
Editor

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MetaNURBs

continued from page 10

to the Head. Now, as you move the Body, the Arms, Legs, and Head will follow, and as you turn the Head, the Eyes and Eyelids will too.

Now we are ready to move those pivot points. You will want the rotation points for the arms to be at the shoulder joints, the leg rotation points at the hip joints, the head rotation point at the neck, and the eyes and eyelids rotation points in the center of the respective eyes. Below I have listed the rotation points I used for my Bear. Depending on the position you saved the objects in Modeler, your rotation points may need to be different from the values I have used for my Bear (Figure 7).

OBJECT	PIVOT POINT COORDINATES
BearHead	(0, -0.0625, 0.0125)
BearBody	(0, 0, 0)
Arm-L	(0.052, -0.101, 0.017)
Arm-R	(-0.052, -0.101, 0.017)
Leg-L	(0.041, -0.1775, -0.0005)
Leg-R	(-0.041, -0.1775, -0.0005)
Eye/Lid-L	(0.022, 0.012, -0.048)
Eye/Lid-R	(-0.022, 0.012, -0.048)

Surfacing and Animation Ideas

I used fractal noise diffusion with a Texture size of (.0001, .0001, .0001) to achieve a furry look to my Teddy Bear. If you happen to own Fiber Factory by MetroGrafx, that may be a great way to surface your Bear. If any of you come up with some good results, I'd love to see 'em!

With the limbs and eyelids being separate objects, making the Bear walk and blink would be some easy animations to start with. From there you may want to add a few Bones to the ears and nose, so the ears can "flop" with the Head movements, and the nose can "sniff." It's amazing how just a few seconds of character animation here and there can spice up a demo full of logos (like mine!). I hope this two-part series helped you develop ideas for future characters and how to model them, as well as show you a few of the possibilities using Modeler's coolest new Tool, MetaNURBS. Until next time, don't let your Teddy Bear out of the house!

LWP

Arnie Boedecker currently animates any free waking moment he can find in his suburban home west of Chicago. He can be reached at awb@ais.net, or the old fashioned way at (708) 213-6384.

This month's disk...

includes objects and scene files from Patrik Beck's "Squeeze" tutorial as well as Jean-Babtiste Laugere's "Fire and Ice" tutorial.

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TUTORIAL

Flight School

Part Two of Creating a 3D Bird

by James M. Curtis

Welcome back to my tutorial series on creating and animating a 3D Bird. In the first installment we created the bird's body and tail feathers. This part details modeling the bird's wings and surfacing the parts.

Since this is an advanced tutorial, it is recommended that you have a thorough knowledge of LightWave 3D Layout. For this tutorial I'll be using version 3.5, but version 3.1 and the newer 4.0 and 5.0 can be used as well.

The screen shots and settings are based on my bird object. Since your bird may differ somewhat in size and shape, you may need to make adjustments to some of the settings given here. However, the basic procedures, placement and envelope settings should still apply.

So without any further delay—let's get going!

Flight Considerations

The wings are the most difficult part of the character to create. Some thought was necessary to decide on which method—Bones or Morphing—would be used to animate the wings. Ideally, Bones would save on modeling time as it would require only one set of wings. But Bones have a tendency to distort objects in places they shouldn't as they are rotated. Using Morphing would require at least three versions of each wing, and would increase modeling time as well as greatly increase the polygon count in Layout.

Despite the increase in polygons, I used Morphing here, because it provides the simplest means of animation control.

The Wings

To start construction of the right side wing, select the Sketch (Objects panel) tool and draw out a wing-like shape in the Top View. Close the spline shape by selecting the start and end points, then Weld (m) them together. Now use the Drag tool to fine tune the spline curve. Once you are satisfied with its look, use the Freeze (Tools panel) button to create the first basic wing shape. Repeat this procedure to create two smaller ones. Figure 15 shows the basic shape.

Next, with the first wing shape in a background layer, use the Box (Objects panel) tool and draw out a flat rectangle in the Top View somewhat bigger than the area covered by the wing shape. Go into the Numeric panel for the Box tool, set it to make 90 segments in the X direction and 30 in the Z direction, and click OK. This creates a segmented flat "d" rectangular shape in the foreground layer and the biggest wing-shape polygon in the background. Choose the Template Drill (Tools panel) tool, and in the requester, select Core operation and set it to the Y axis. Click OK. The segmented polygon grid will be left filling the wing shape. Figure 16 shows an example of this. Triple (T) the polygons and repeat the same operations for the two smaller wing shapes.

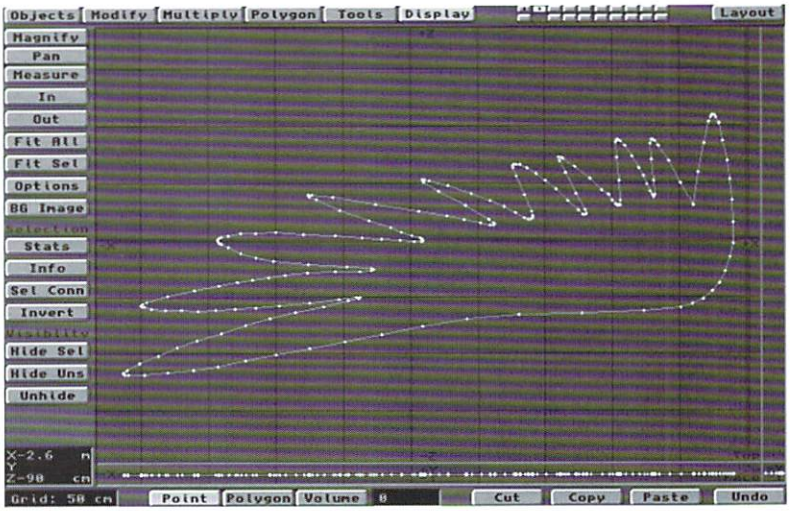


Figure 15: The basic wing shape.

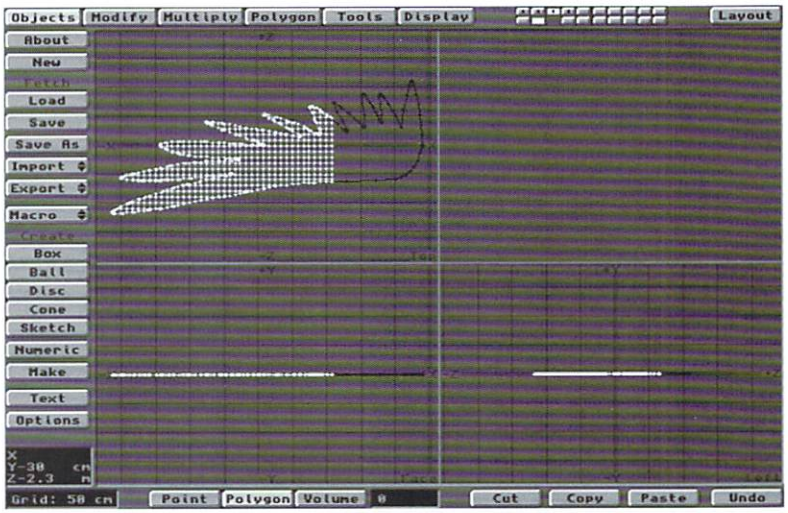


Figure 16: Use the Template Drill tool to fill the wing shape with a segmented polygon grid.

To add depth to each wing section, use the Lasso (Right Mouse Button) tool and select the points inside the perimeter of the wing section, taking care not to select any at the edges. Now, use the Move (Modify panel) tool to pull the points upward slightly. To create the bottom side of the wing, Mirror (Multiply panel) the object at it's bottom edge (Y = 0). After mirroring, I recommend that you use the Merge Point (Polygon panel) tool on it. Repeat

these procedures for the other wings sections. Save each section as a separate object temporarily in case you need to go back.

Now we're ready to start putting the basic wing together. As seen in Figure 17, by stacking the sections on top of each other in size order (big at the bottom to small at the top), a decent layered wing object for use in making the Morph Targets is made. Then use the Move (Modify panel) tool to line up the wings' inside edges just outside the X axis center. This is done to act as a pivot point or hinge joint for use later in Layout.

Once satisfied with how it looks, give the final object a Surface (q) of "Wing_Feathers" and Triple all the polygons. Save the object out as "BW_Basic_Right.lwo." Using the Mirror (Multiply panel) tool, create the opposite side and name it "BW_Basic_Left.lwo."

Making the Morph Targets

To make the wing flap movement as fluid and realistic as possible, you need to make four Morph Targets for each left and the right side wing. The Flying Phases diagram will serve as the reference for how these need to look. The Magnet (Modify panel) tool will be used to create the morphing versions of the basic wing object.

To create the full upward version of the wing (Phase 2), draw the Magnet tool's bounding box out around the object in the Face View. Then position it so the center crosshair of the Magnet extends past the outer tip of the wing half of the length, as seen in Figure 18. Now, drawing the mouse upward, you'll see the effect of the Magnet Tool on the object. Because the position of the Magnet's center is offset beyond the outer edge of the object, it affects the object by giving the end less of a gradual curve, keeping the wing tips straighter. Figure 19 shows the effect.

Once you're satisfied with how it looks, save the modified object as "WM_R-FullUp.lwo." Check the Numeric settings for the Magnet tool and write them down for later use on the left side version. Hit Undo to return the modified object to its basic form again.

To create the full downward version of the wing (Phase 4), keep the Magnet tool's bounding box drawn out exactly the same as before, but this time, move the mouse downward until it looks right. Save this modified object as "WM_R-FullDwn.lwo" and once again use Undo to return it to it's original state. The result is shown in Figure 20.

For the half upward version of the Wing (Phase 1), change the Magnet tool's bounding box size and position so that the center point is now located at the edge of the wing tip, as in Figure 21. Drag the mouse upward. The curve of the wing is now affected a bit differently, giving the tips a rounder curve toward the top, as shown in Figure 22. Save this out as "WM_R-MidUp.lwo." Once again write down the Magnet tool's Numeric settings for use on the left side versions, and return the object to normal by hitting Undo.

Finally, for the half downward wing (Phase 3), use the same settings as before, but now draw the mouse downward until it looks right and save the object as "WM_R-MidDwn.lwo." The resulting object is shown in Figure 23.

Now, to make the left side morph objects, use the Numeric values written down earlier, and for each of the steps, change the Numeric value for the Magnet tool's X Axis Center from - to +. Save these different versions out with the following names:

WM_L-FullUp.lwo
WM_L-FullDwn.lwo
WM_L-MidUp.lwo
WM_LMidDwn.lwo

Once this is done, the initial construction is complete!

> You could give your bird almost any surface color imaginable.

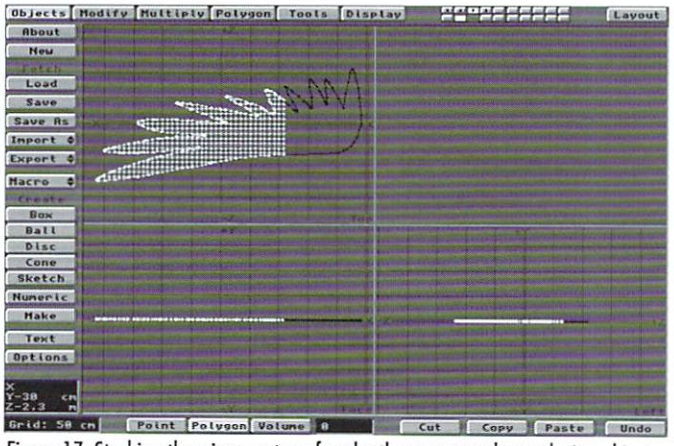


Figure 17: Stacking the wings on top of each other creates a layered wing object.

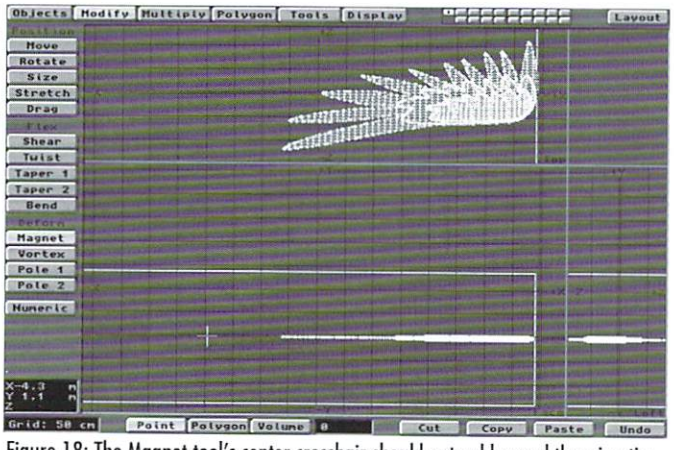


Figure 18: The Magnet tool's center crosshair should extend beyond the wing tip.

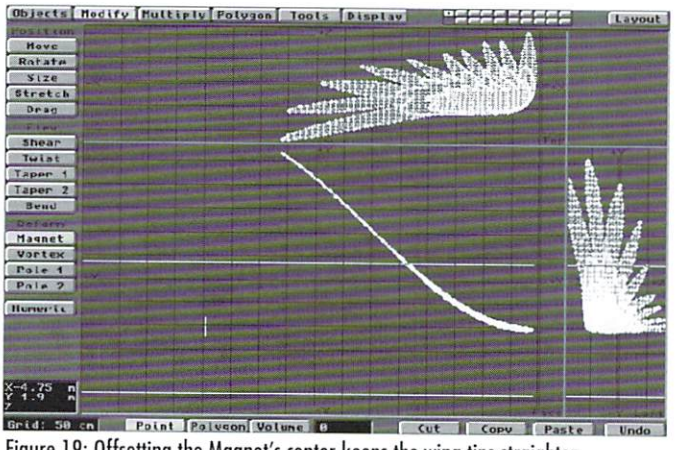


Figure 19: Offsetting the Magnet's center keeps the wing tips straighter.

Feathered Friend Coloring

Birds have coloring that helps determine a specific species. You could give your bird almost any surface color imaginable, but keep in mind how it will be used. The surfaces and textures used here are based on the part my bird plays in the *Vengeance Quest* fantasy animated short. This color scheme will yield a very light blue to almost white

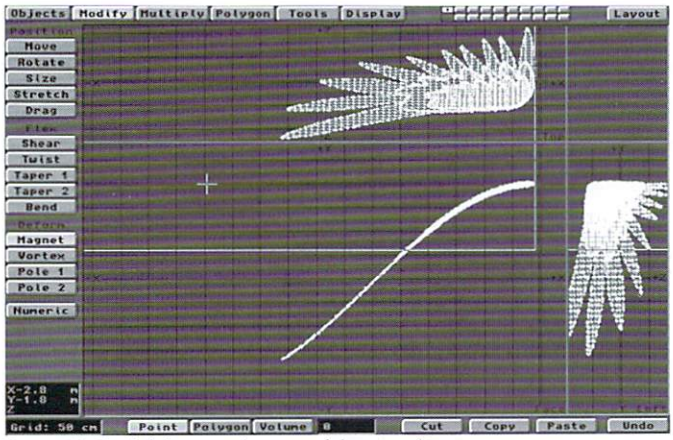


Figure 20: The full downward version of the wing object.

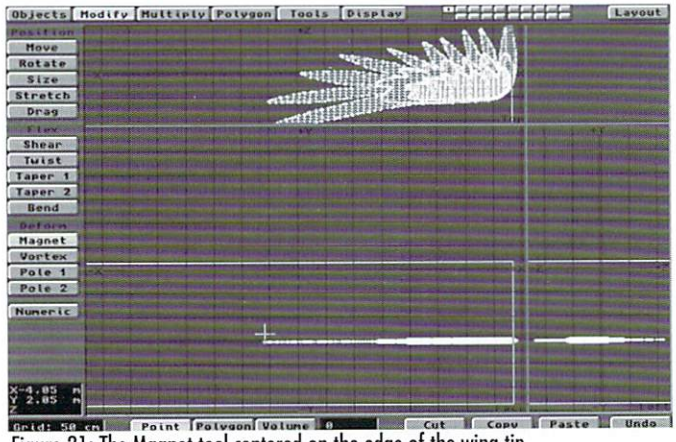


Figure 21: The Magnet tool centered on the edge of the wing tip.

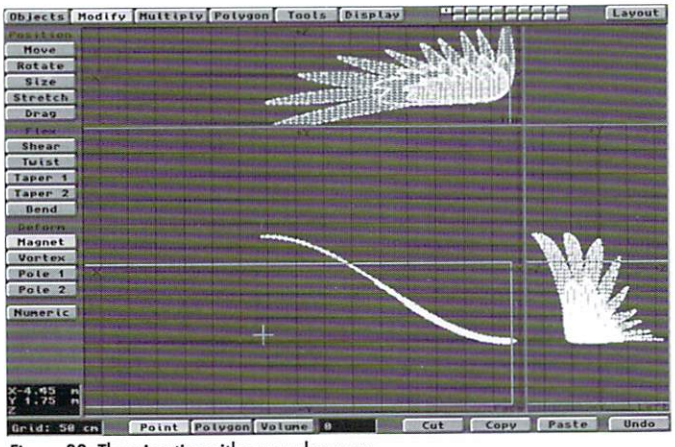


Figure 22: The wing tips with a rounder curve.

bird. Its coloring is very subtle, but it fits the character and charm of my bird perfectly. The list only contains items to be changed and all others should remain at the default settings.

Go to the Surfaces Panel and set the following parameters:

Bird_Wings Surface
Surface Color 220, 220, 220
Surface Color Texture
Texture Type Fractal Noise
Texture Size 1.0, 1.0, 1.0
Texture Color 76, 101, 128
Frequencies 3
Contrast 0.6
Specular Level 15%
Glossiness Medium
Smoothing Angle 89.5

Bird_Body and Bird_Thigh Surface
Surface Color 220, 220, 220
Surface Color Texture
Texture Type Fractal Noise
Texture Size 1.0, 1.0, 1.0
Texture Color 76, 98, 129
Frequencies 3
Contrast 0.6
Specular Level 15%
Glossiness Medium
Smoothing Angle 89.5

Bird_Belly Surface
Surface Color 240, 240, 240
Specular Level 15%
Glossiness Medium
Smoothing Angle 89.5

Bird_Feet Surface
Surface Color 220, 132, 0
Specular Level 15%
Glossiness Medium
Smoothing Angle 89.5

Bird_ToeNails Surface
Surface Color 0, 0, 0
Specular Level 21%
Glossiness Medium
Smoothing Angle 89.5

Bird_Beak Surface
Surface Color 200, 171, 0
Diffuse Level 90%
Specular Level 66
Glossiness Medium
Smoothing Angle 70.5

Bird_EyePupil Surface
Surface Color 0, 0, 0
Specular Level 50%

Bird_EyePupil2 Surface
Surface Color 67, 52, 34
Specular Level 46%
Glossiness Medium
Smoothing 89.5

Bird_EyeWhites Surface
Surface Color 200, 200, 200
Specular Level 45%
Glossiness Medium
Smoothing 89.5

Bird_Nostrils Surface
Surface Color 230, 230, 230
Surface Color Texture
Texture Type Fractal Noise
Texture Size 1.0, 1.0, 1.0
Texture Color 76, 101, 128
Frequencies 3
Contrast 0.6
Specular Level 15%
Glossiness Medium
Smoothing Angle 89.5

Optional Surfacing:

You may want to try and use additional surface textures to increase the realism of your bird object. Here is one that I think you should try. It creates the illusion of the plated skin over the legs, feet, and toes of most birds.

Bird_Feet Surface

Surface Color 220, 132, 0
Surface Color Texture
Texture Type Bump Array
Texture Color 220, 132, 0
Radius 0.1
Spacing 0.1
Bump Strength -0.5

Notice that the Surface and Texture colors are the same. The reason for this is that we are not trying to create a different colored skin texture, but just the illusion that the legs and feet are plated and bumpy like most birds. Also, the Bump Strength setting is negative because the texture should appear to protrude outward from the surface.

That's all for now. In next month's concluding installment, we'll work on creating a fluid simulation of flight.

LWP

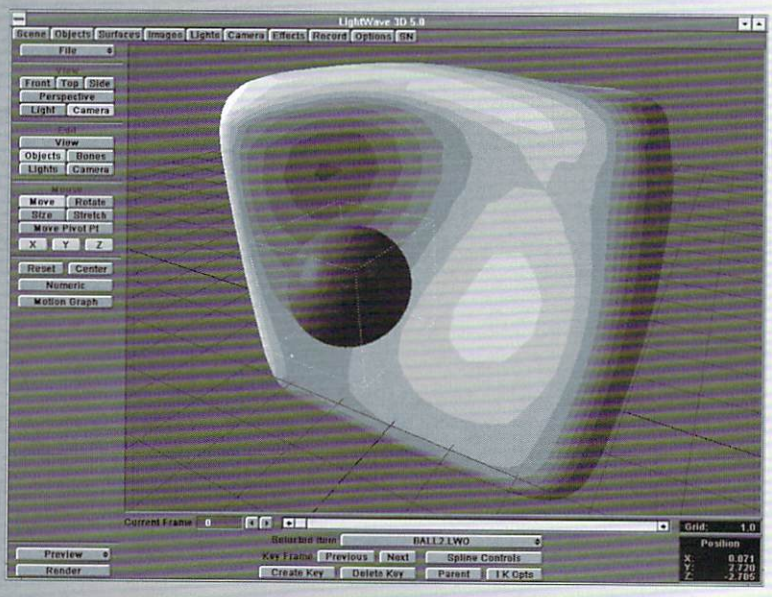
Jim Curtis is currently looking into the 3D video game market and hopes to bring his Vengeance Quest *characters into the games. He can be contacted by voice at (216) 354-6239.* *Vengeance Quest © 1996 JMC Graphics.*

Tip of the Month

See MetaMation work in Real Time

by Dan Ablan

If you've worked with any of the new plug-ins in LightWave 5.0, you know just how powerful they are. But here's a tip you may not know when using MetaMation, Effector or any Displacement Map plug-in. Turning on auto Key Adjust and Auto Key Create will let you view what's happening in real time. Without these set, you need to set a keyframe to view MetaMation do its thing, for example.



Normally, using auto Key Adjust or the newly added Auto Key Create are very dangerous for those used to earlier versions of LightWave Layout. Too often, animators can forget that these features are turned on, and their camera, lights and objects mysteriously lock into place wherever they tend to be. Most of the time, this is a bad thing because it's easy to make a wrong move with an object after carefully setting up a keyframe. If you make a mistake setting up the next keyframe, pressing Previous or Next Keyframe resets the object back. With Auto Key Adjust and Auto Key Create, the mistake is permanent.

But in the case of MetaMation or Effector, wireframe or OpenGL previews would not show the effect either plug-in has in a scene. With Auto Key Adjust and Auto Key Create toggled on, you can move a ball and watch it displace a rounded box in real time, as in Figure 12. The same rule applies to MetaMation. As you animate your simple "pre-metaformed" object in Layout, a smooth metaformed object will show up when you render using MetaMation. Bit by turning on the "Auto" keys, you can see the transformation in either wireframe or OpenGL mode at any frame. Be careful using these controls as they can cost you time after a lengthy animation set up. A tip to think of is turn them on to view the displacement map effect in real time, then turn them off.

One final note: Be aware that Auto Key Create and Auto Key Adjust, if left on when you exit LightWave, will be remembered in LightWave's config file. Therefore the next time you start, they will be toggled on automatically.

Dan Ablan is president of AGA Digital Studios in Chicago.

LightWave 101

A Two-Part Tutorial on Making Fire and Ice

by Jean-Babtiste Laugere

Since the beginning of time fire has been an obsession for humans. Traditional methods for creating realistic fire in LightWave 3D consist of making a cylinder and surfacing it with a fractal noise texture simulating a gas volume. Realistic, perhaps, but not as flexible as we might wish.

Here we are going to see a method that can give you precise control over your flames. The results may be somewhat less realistic than other methods and for static pictures, it may appear a bit too solid, but it does provide unique control over your flame objects.

Making an Object to Burn

We are going to make a simple tube to illustrate this method. So let's start in Modeler:

We are going to make a simple tube object by extruding a disc along a spline. For the disk, use the Disc primitive (Object Menu) then hit (n) for numeric input, and enter the following parameters:

Sides	16
Segments	1
Bottom	-8 m
Top	-8 m
Center	0, -2 m, 0
Radii	0, .5 m, .5 m
Axis	X

Press Enter to make the object. (You can zoom out to see the disc.)

Keep this disc in the first layer, then go to the second one. In this layer we are going to make a five-point curve that will be used to extrude the disc. Click the Points button from the Polygon menu, then hit n for a numeric input and enter the following coordinates:

Point 1	-8, -2, 0 (Select OK, Enter to create)
Point 2	-4, -2, 0
Point 3	0, 0, 0
Point 4	4, 2, 0
Point 5	8, 2, 0

If you've followed the directions above, you will see five selected points. If they aren't selected then select them from left to right (points must be selected in this order otherwise our curve won't be correct). Then go to the Tools menu and push the Make button (from the sub-menu entitled Curves) or press Ctrl-p.

Now that we have our extrusion path (or rail), you can go back to the first layer, where your disc objects should be present. Select the second layer as the background layer. You should see your disk object and the curve in the same view (curve must be black or dark as shown in Figure 1).

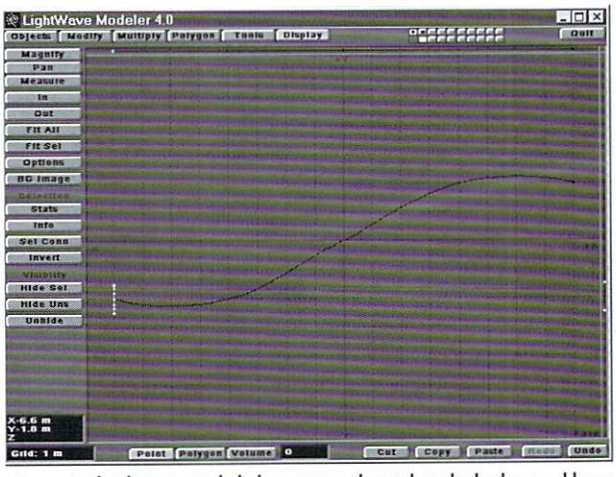


Figure 1: The disc is extruded along a curve located on the background layer.

To extrude an object along a curve path, click the Rail Ext button from the Multiply menu. Choose the following parameters:

Segments
Automatic
Oriented On

Press OK to extrude the disk. (For our example, it doesn't matter if the oriented option is on or not. If non oriented, the disk object will stay vertical all along the path, where Oriented causes the disk polygon to align to the path segment.) You should end up with the object shown in Figure 2.

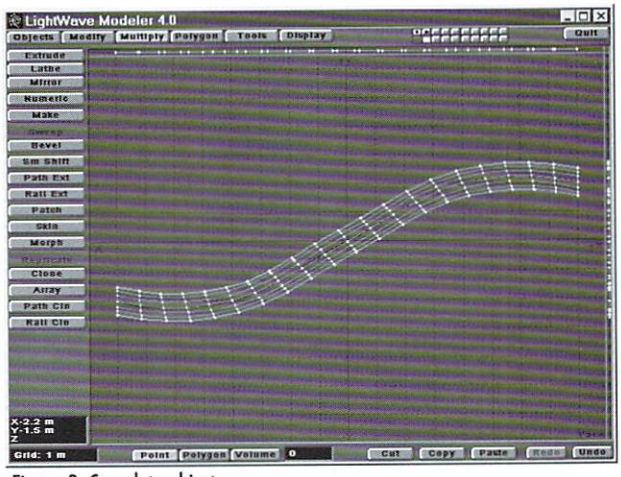


Figure 2: Complete object.

Change the name of the surface (Q or the Surface button from Polygon menu) to "FireTube.Surface" and save this object as "Tube.Lwo."

Flames

In another layer load (or copy) the object that you have just made and select all the polygons. (Note that this is a special case here, normally, for bigger objects, you can select only polygons where you wish to put flames.)

Select the Jitter operator (Tools Menu) and choose Gaussian and input the following values :

X= 0m
Y= 12 m (to make vertical flames)
Z= 0m

You should be left with an object that looks like

Figure 3. Now you can remove (or move up) any points that would appear under the tube object. These polygons are going to be the Flames of your object. If you wish, you can modify the points to change the look of your flame shape.

Name the flames polygons surface as "Flame.Surface" and save this last object as "Flames.Lwo."

Scene Parameters

You can now go into Layout and load your two objects. In the Objects panel, turn off Self Shadow for the flames object otherwise you will see some black surfaces inside the flames if you are casting shadows.

Parent the flames object to the tube so you can move them about together.

Go to the surface panel and input these parameters:

Flame Surface:	
Surface Color	0, 0, 0
Surface Color Texture	
Texture type	Underwater
Texture size	9000, 5000, 50000
Texture center	100, -1.0, 100
Texture falloff	0, 5.0, 0
Texture velocity	0, 2.0, 0
Texture color	255, 83, 38 (Orange to red)
Wave sources	10
Wave length	1.0
Wave Speed	0.025
Band Sharpness	4.0
Luminosity	100%
Diffuse Level	100%
Additive	On
Specular Level	0%
Reflectivity	0%
Transparency	0%
Transparency Texture	
Texture type	Fractal Noise
Texture size	0.1, 5.0, 0.5
Texture center	0, 0, 0
Texture falloff	0, 0, 0
Texture Velocity	0, 0.25, 0
Texture Value	100%
Frequencies	4
Contrast	4.0 (low values soften and darken flames)
Edge Transparency	Transparent
Edge Threshold	1.0
Smoothing	On
Glow Effect	On

Tube Surface

These values should be the same as above except Texture Color (under Surface Color) should be set to 255, 220, 96. Also, turn Double Sided on.

Wrapping Up

Choose a Display Device and render out an image of your flame objects. Because Jitter is a random tool, you may not always get good results. Here's what you can do to make your objects look a bit better:

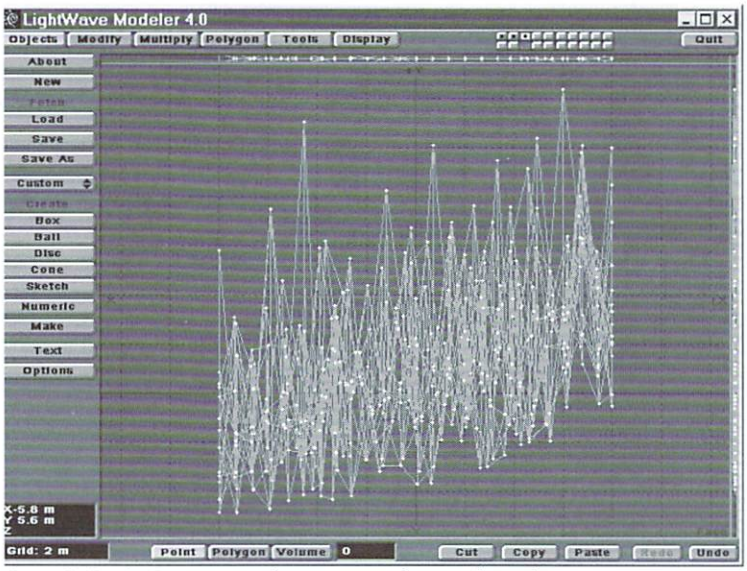


Figure 3: Use the Jitter command to create something similar to this.

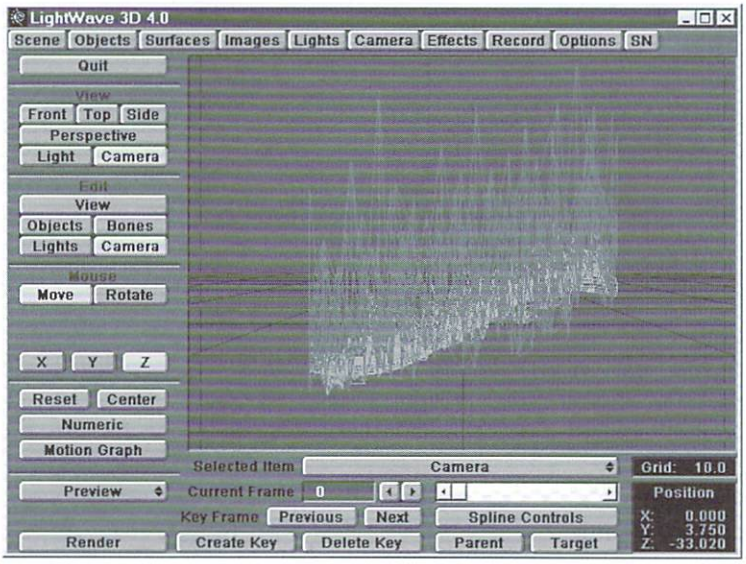


Figure 4: In Layout, it already seems to be on fire.

If you can see polygons inside the flames:

In Modeler use the Triple command (Polygon menu) on your flames object, then Subdiv it (Polygon menu) by choosing Smooth or Metaform.

Remember that using the Metaform option causes flames to be less high so you will need to Stretch (Modify menu or in Layout) them a little.

If the density of flames do not look correct :

To decrease density you can turn off the Double sided option (Surfaces panel) and if that isn't enough, add some transparency level.

To increase density, do the opposite. I think that keeping Double Sided off gives a better result.

An example of how your flames can look can be found in the color pages of this issue. For this image, I added another flames object (a clone of the first) and stretched both flame objects along Z to get them to surround the tube and increase the fire effect.

You may want to try adding a few things to get an even more effective fire look. For example, you could add some flares along the surface of your burning object. For an animation, you could generate a few different flame objects from your first one and morph between them to get the effect of crackling flames. Try adding some bones and moving the flames as if a wind was blowing on them.

Next time, we'll take a look at creating the other half of fire and ice—Ice! Until then, keep cool.

LWP

Jean-Babtiste Laugere is an Art Director and programmer for Newave Ltd. A graphics company located in France.

From the Net

continued from page 5

each bone in it's final position.

Bones and IK

It's really much easier than you think to use Bones and Inverse Kinematics.

Select the BoxFoot.lwo Object and press the plus key on the numeric keypad (+) for Add Null Object. Position this null at the tip of the foot, and create a key at frame zero. Rename the Null Toe_GOAL by pressing the Save Object button under the Objects Panel. For a Null object, it doesn't really get saved, just renamed. Add another null and place it towards the ankle of the foot object and create a key at frame 0.

Again, select BoxFoot.lwo and then select Bones from the Edit menu. Choose the Toe bone (or the last bone you set) and press the IK Opts button for Inverse Kinematics setup. Set the Goal Object to Toe_Goal (or whatever that particular Null is named). Click Full Time IK, and set the Goal Strength 0.5. Click Continue, and then select the foot bone. Select IK Opts and set the Goal Object to the Ankle_GOAL (null object). Keep the Goal Strength at 1.0 and click Continue. When you select one of the Goal null objects, such as the ankle or toe goals, the bone structure will follow. Figure 7 shows the Ankle_GOAL moved up and over, while the Toe_GOAL is moved down to tilt the foot.

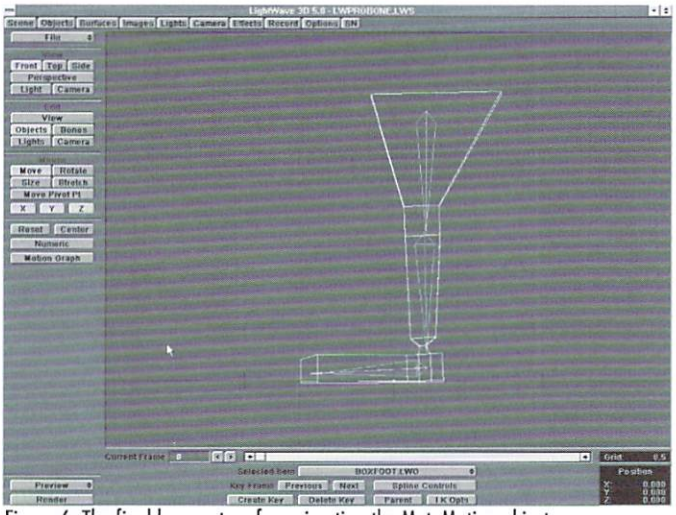


Figure 6: The final bone set up for animating the MetaMation object.

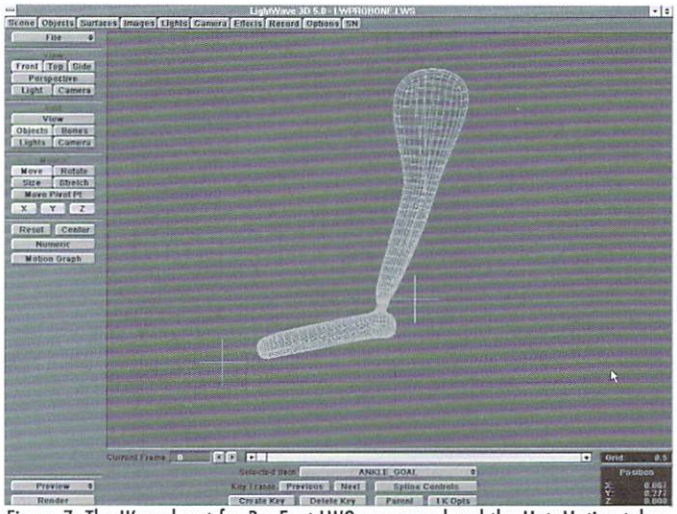


Figure 7: The IK goals set for BoxFoot.LWO are moved and the MetaMation takes effect, transforming the box object into a smooth shape.

Each time you move the Goal nulls, create a key. When the screen redraws, you'll see the metaformed object take shape.

The Next Step

This is a very simplistic example of MetaMation, but the procedures can apply to more complex objects. A couple of ideas to consider are a hand object. A low polygon count object set with bones can be transformed into a smooth high polygon count hand object at rendering time. A full character can be a simple man made out of boxes, but when rendered, the clean shape of the man takes form. A situation like that is a great time to use MetaMation. Setting up a bones and IK scene with a full character can really bog down a system. Using the MetaMation plug-in can simplify not only your Layout, but your workload as well. LWP

Dan Ablan is president of AGA Digital Studios in Chicago. He is the author of The LightWave Power Guide, *writes the monthly "Dr. Toaster" column in* Video Toaster User, *and can be seen on two* In.Focus *training tapes from ProWave. He's beginning to remember what sunlight and open air are. Welcome back, Dan!*

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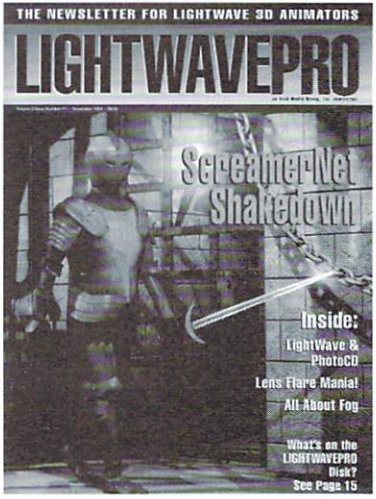

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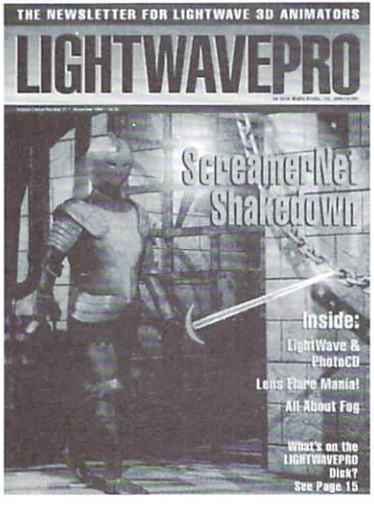

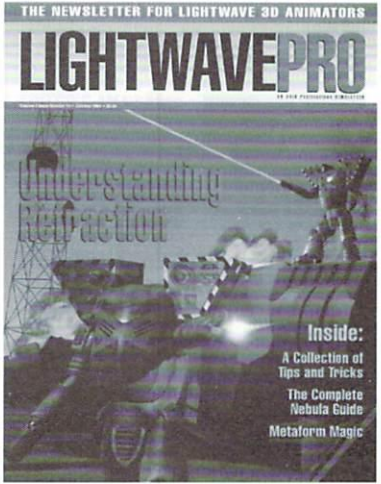

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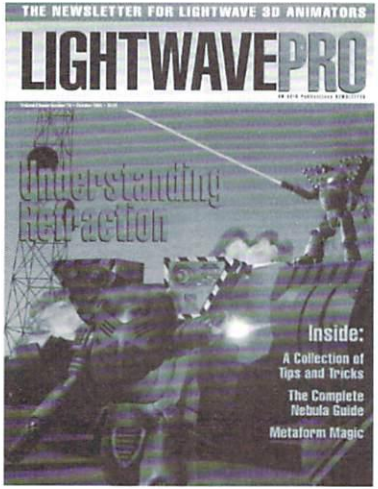

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